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# **CMS Reverse Engineering & Encore/Model Integration**

**Contract # N00014-91-C-0240  
Office of Naval Research  
Arlington Virginia 22217-5000**

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**Data Item A001  
Bi-Monthly Progress Report**

**Reporting Period  
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**TO:** Distribution  
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**DATE:** January 21, 1992  
**SUBJECT** Bi-Monthly Status Report - Contract # N00014-91-C-0240

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### **1. Interim Status Meeting**

An interim status meeting was held at NSWC White Oak on December 12, 1991 to review the progress to date on the subject contract, and to discuss and attempt to resolve some of the outstanding contract issues. The following is a summary of that meeting:

- A presentation was made detailing the proposed strategy for the ENCORE/MODEL integration (Task 3). All parties seem to agree with regard to the overall strategy suggested for the integration of the GE ENCORE Reengineering Technology Workstation and the Computer Command and Control Company's MODEL system. Since that meeting, documentation of ENCORE's internals has been sent to CCCC, with more to follow.
- Our need for larger complete samples of CMS-2 software systems was discussed. There seems to be a dearth of large unclassified examples of CMS-2 source code. GE-CRD has a secure facility which will be available for this program pending our receipt of the appropriate security (DD-254) forms from NSWC. Once we are able to make use of that facility, we will still depend on NSWC for sample software.
- Project-specific style manuals were requested from NSWC. We have since received the *ASWCS MK116 MOD 7 Computer Program Standards Manual*.
- There was a discussion of GE's willingness to make available to NSWC the preliminary executables for the work done to date, so that NSWC (and GE) could get specific feedback from their CMS-2 software engineers. In order for this to take place, NSWC must procure a copy of Teamwork's CREV, and identify a contact person at NSWC.
- A request was made by NSWC for a list of specific CMS-2 constructs accepted by our parser and translator. We are compiling this for the late January time frame.
- A demonstration was given of the reverse engineering system's current capabilities. Screen-prints from this presentation are included with this status report.
- It was noted by GE that the program (authorized for \$126,214 of which \$100K has been appropriated) will exceed 85% of current appropriation by January 1, 1992.

### **2. Task 1a: Language Processing and Analysis**

The parser is currently being expanded to handle the following constructs. Work on the first two of the following has been completed:

- **CMS-2 macros (MEANS and EXCHANGE):** CMS-2 macros are expanded within the scope of the macro definitions.
- **Com pools:** during the parsing of a CMS-2 top level file, all the com pools referenced by the top level files are processed to collect relevant information to populate the different symbol tables.
- **CSWITCH directives:** The parser is currently being extended to handle these constructs.

### 3. Task 1b: Comment Processing

A general approach to the processing of comments contained within CMS-2 source code has been identified. It will involve identifying and extracting the comments (with some context information) and using existing general-purpose text processing software utilities (eg awk or sed) to convert the extracted comments into useful Teamwork information. The data to be culled from the CMS-2 has been defined, and implementation of the extractor is underway.

### 4. Task 2: Data Extraction & Interface To Teamwork/SD

A prototype demonstration system is currently operational which produces a CADRE Teamwork/SD structure chart and Data Dictionary from CMS source code. This demonstrates the capabilities of passes 3 and 4. The portions of the reverse engineering software completed to date have been used to produce the necessary data for the CADRE cdif files which were then processed with CADRE's C-REV and Teamwork/SD to produce working structure charts and data dictionary entries. A copy of a sample session produced from NSWC files is included with this report.

We have completed about 3/4 of the Pass 3 design, and roughly 2/3 of the implementation. Pass 4 exists in its entirety. The tasks remaining to be completed in Pass3 are the production of data usage information and the generation of com pool and include file hierarchies. Also remaining is the choice of software to be used for testing; the selection is to be done by mutual agreement between NSWC and GE.

### 5. Task 3: ENCORE/MODEL Integration Study

On December 6th a meeting was held at Computer Command and Control Corporation to discuss the issues involved in communicating software design information between the MODEL and ENCORE systems. Also, negotiations are taking place to institute a joint venture (outside the scope of this contract) whereby CCCC will use GE's ENCORE to perform FORTRAN-to-Ada translation and reengineering. We believe that this activity will familiarize CCCC with the operation and capabilities of ENCORE. This, together with the internal documentation which we have provided CCCC, should provide them with a good understanding of the ENCORE system.

To date, we have found no technical reason why GE's ENCORE and CCCC's MODEL systems cannot be integrated. What is left to be decided is whether this should be done and the availability of funding. We anticipate that our final report will provide the pros and cons, as we see them.

A Software License agreement has been signed between GE and CADRE Technologies which will permit expansion of their Structure Chart layout software so as to accommodate the Teamwork/SD representation of very large software systems. This agreement between the two parties will provide for expanded reverse engineering capabilities in processing CMS-2, FORTRAN, C and JOVIAL

## **Appendix 1:**

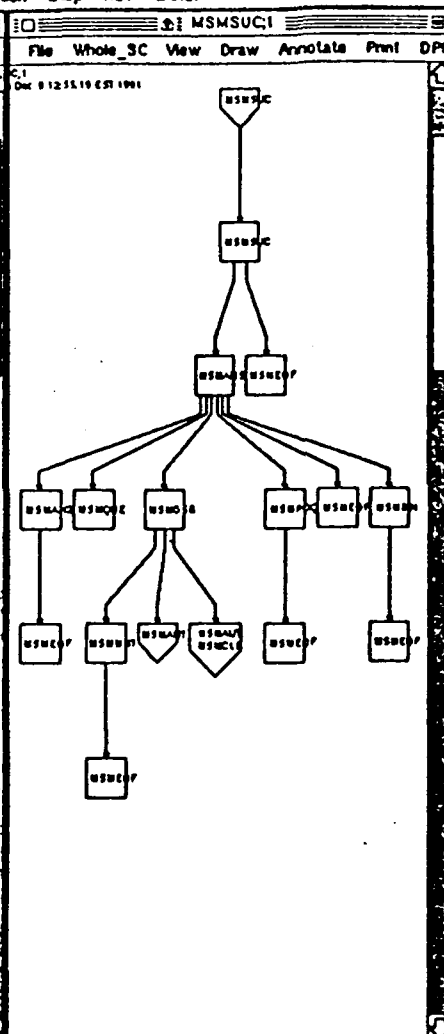
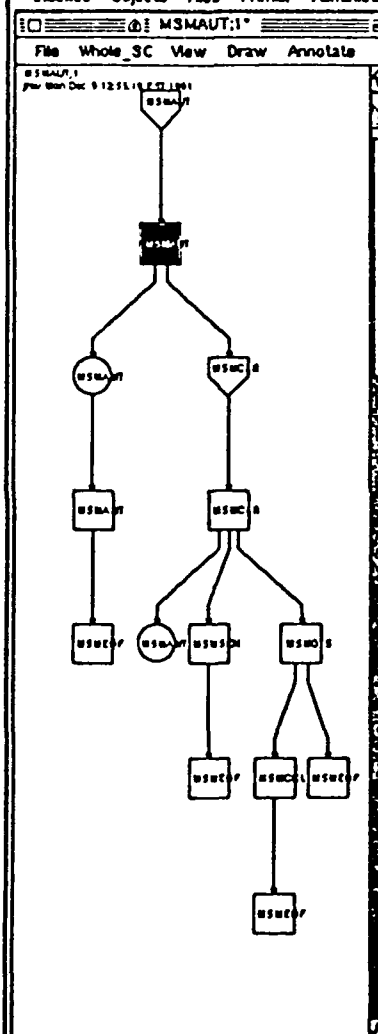
### **Screenprints from TeamWork Demonstrating the Current Capabilities of CMS-Rev**

File Whole\_MDT View Print List

COMP CND  
COMP job\_test  
COMP NSVC  
COMP PROP  
COMP SAMPLE  
COMP SMALL

File Whole\_Model View Annotate Print AutoGraph RET CREF

NS	ANCH	ANCH (1)	
NS	DBPMODE	DBPMODE (1)	
NS	DBSMODE	DBSMODE (1)	
NS	EXDEGPER	EXDEGPER (1)	
NS	EXDERS	EXDERS (1)	
NS	EXEXIT	EXEXIT (1)	
NS	EXQUEVE	EXQUEVE (1)	
NS	EXSTOPER	EXSTOPER (1)	
NS	GNALERT	GNALERT (1)	
NS	GNEMO	GNEMO (1)	
NS	GNINTT	GNINTT (1)	
NS	GNIMPPOO	GNIMPPOO (1)	
NS	GNIMTIN	GNIMTIN (1)	
NS	GNHODCH	GNHODCH (1)	1
NS	GNHODE	GNHODE (1)	
NS	GNHODDER	GNHODDER (1)	
NS	GNHODUAL	GNHODUAL (1)	
NS	GNSTCC	GNSTCC (1)	
NS	GNTRAZM	GNTRAZM (1)	
NS	NSKAM2	NSKAM2 (1)	
NS	NSKAMS	NSKAMS (1)	
NS	NSKAMT	NSKAMT (1)	
SC	NSKAUT	jrev Mon Dec 9 12 55 19 EST 1991 (1)	
NS	NSKAUT	NSKAUT (1)	
NS	NSKBIN	NSKBIN (1)	
NS	NSKCL	NSKCL (1)	
NS	NSKCLR	NSKCLR (1)	
SC	NSKCMR	jrev Mon Dec 9 12 55 19 EST 1991 (1)	
NS	NSKCMR	NSKCMR (1)	
SC	NSKCOO	jrev Mon Dec 9 12 55 19 EST 1991 (1)	
NS	NSKCOO	NSKCOO (1)	
SC	NSKDMU	jrev Mon Dec 9 12 55 19 EST 1991 (1)	
NS	NSKDMU	NSKDMU (1)	
SC	NSKDWL	jrev Mon Dec 9 12 55 19 EST 1991 (1)	
NS	NSKDWL	NSKDWL (1)	
NS	NSKOP	NSKOP (1)	
NS	NSKOSR	NSKOSR (1)	
SC	NSNOT1	jrev Mon Dec 9 12 55 19 EST 1991 (1)	
NS	NSNOT1	NSNOT1 (1)	
SC	NSNOT2	jrev Mon Dec 9 12 55 19 EST 1991 (1)	
NS	NSNOT2	NSNOT2 (1)	
NS	NSNOT3	NSNOT3 (1)	
SC	NSNOTR	jrev Mon Dec 9 12 55 19 EST 1991 (1)	
NS	NSNOTR	NSNOTR (1)	
SC	NSNIS2	jrev Mon Dec 9 12 55 19 EST 1991 (1)	
NS	NSNIS2	NSNIS2 (1)	
NS	NSNIMI	NSNIMI (1)	
SC	NSNOAR	jrev Mon Dec 9 12 55 19 EST 1991 (1)	
NS	NSNOAR	NSNOAR (1)	
SC	NSNOOO	jrev Mon Dec 9 12 55 19 EST 1991 (1)	



```

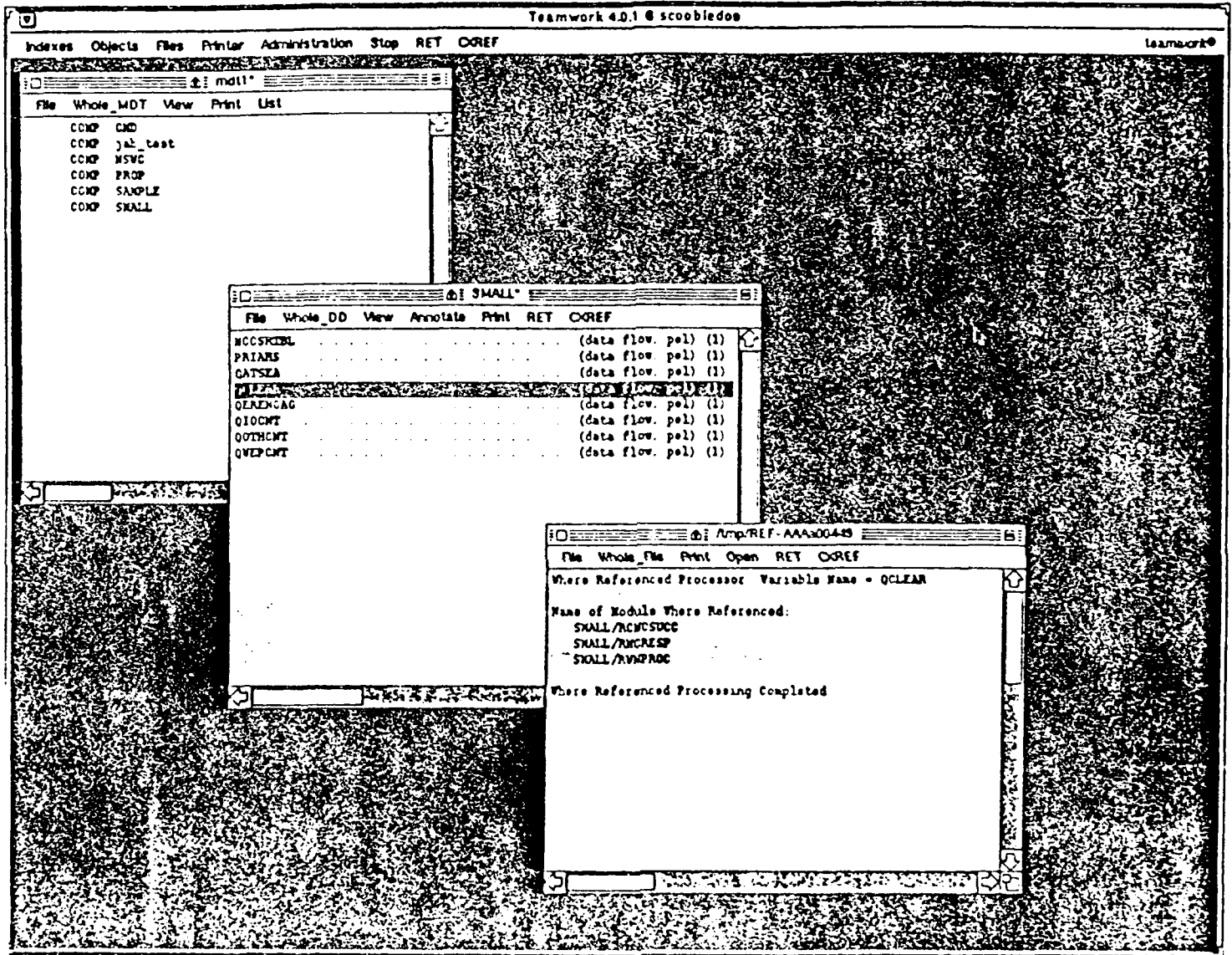
00000000 MSMAUT;1
File Whole_M-Spec Annotate Print RET OREF
TITLE: KSKAUT
PARAMETERS:
LOCALS:
GLOBALS:
BODY:
calls :
    KSKOUT
    KSKCLR
called by :
    KSKMSR

00000001 MSMGSR;1
File Whole_M-Spec Annotate Print RET OREF
TITLE: KSMGSR
PARAMETERS:
LOCALS:
GLOBALS:
BODY:
calls :
    KSKOOT
    KSKAUT
    KSKCLR
called by :
    KSKMAY

00000002 MSMAMS;1
File Whole_M-Spec Annotate Print RET OREF
TITLE: KSKAMS
PARAMETERS:
LOCALS:
GLOBALS:
BODY:
calls :
    KSKARZ
    KSKOQT
    KSKOSR
    KSKPDQ
    KSKZOF
    KSKZIN
called by :
    KSKMAY

00000003 MSMWUC;1
File Whole_M-Spec Annotate Print RET OREF
TITLE: KSKWUC
PARAMETERS:
LOCALS:
GLOBALS:
PRIAHS: data_in
MCCRTBL: data_in
BODY:
calls :
    KSKARS
    KSKZOF
called by :

```





Indexes Objects Files Printer Administration Stop RET OREF

File Whole File Print Open RET OREF

Where Referenced Processor: Variable Name = QCLEAR

Name of Module Where Referenced:

SMALL/RMCSSUCC

SMALL/RMCRESP

SMALL/RVMPROC

Where Referenced Processing Completed

File Whole\_M-Spec Annotate Print RET OREF

TITLE: RMCRESP

PARAMETERS:

LOCALS:

GLOBALS:

QCLEAR : data\_in

QWPCNT : data\_in

QIOCNT : data\_in

BODY:

calls :

Library/CBSMODE

Library/EXCEQUE

Library/ODMODE

Library/OWINTT

Library/OWALENT

Library/ONSUCC

Library/ANCM

Library/EXQUEUE

Library/RCMC

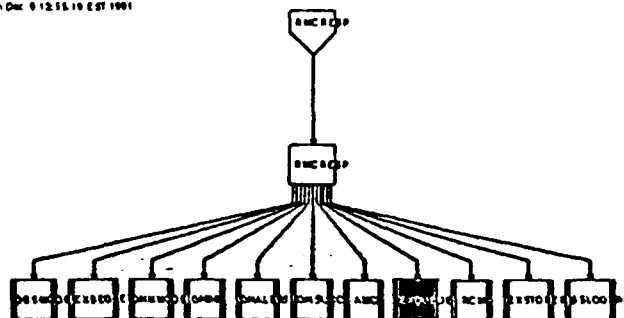
Library/EXSTOPER

Library/SSL00ERR

called by :

RMCSSUCC

File Whole\_SC View Draw Annotate Print DPI DocGen RET OREF

RMCRESP:1  
Fri Jan Dec 9 12:55:10 EST 1991

File Whole\_M-Spec Annotate Print RET OREF

TITLE: EXCEQUE

PARAMETERS:

LOCALS:

GLOBALS:

BODY:

.....

• MODULE BELONGS TO EXTERNAL LIBRARY

.....

calls :

called by :

RVMPROC

RMCRESP

RMCSSUCC

RMCSPEND

RMCINTT

File Whole\_MDT View Print List

COMP CND  
COMP job\_test  
COMP NSWC  
COMP PROS  
COMP SAMPLE  
COMP SKALL

File Whole\_Model View Annotate Print AutoGraph RET CREF

NS	P1	P1 (1)
NS	P2	P2 (1)
NS	PTOT1	PTOT1 (1)
NS	PTOT2	PTOT2 (1)
NS	PTOT3	PTOT3 (1)
SC	MAINTOT	jrev Mon Dec 9 12 58 34 EST 1991 (1, 2)
NS	MAINTOT	MAINTOT (1)
SC	MAINTOT_A	jrev Mon Dec 9 12 58 34 EST 1991 (1, 2)
NS	MAINTOT_A	MAINTOT_A (1)
SC	MAINTOT_B	jrev Mon Dec 9 12 58 34 EST 1991 (1, 2)
NS	MAINTOT_B	MAINTOT_B (1)
SC	MAINTOT_C	jrev Mon Dec 9 12 58 34 EST 1991 (1, 2)
NS	MAINTOT_C	MAINTOT_C (1)
SC	MAINTOT_D	jrev Mon Dec 9 12 58 34 EST 1991 (1, 2)
NS	MAINTOT_D	MAINTOT_D (1)
SC	MAINTOT_E	jrev Mon Dec 9 12 58 34 EST 1991 (1, 2)
NS	MAINTOT_E	MAINTOT_E (1)
SC	MAINTOT_F	jrev Mon Dec 9 12 58 34 EST 1991 (1, 2)
NS	MAINTOT_F	MAINTOT_F (1)
SC	MAINTOT_G	jrev Mon Dec 9 12 58 34 EST 1991 (1, 2)
NS	MAINTOT_G	MAINTOT_G (1)
SC	MAINTOT_H	jrev Mon Dec 9 12 58 34 EST 1991 (1, 2)
NS	MAINTOT_H	MAINTOT_H (1, 2)
NS	MAINTOT_I	MAINTOT_I (1, 2)
SC	MAINTOT_J	jrev Mon Dec 9 12 58 34 EST 1991 (1, 2)
NS	MAINTOT_J	MAINTOT_J (1, 2)
NS	P0	P0 (1)
NS	P11	P11 (1)
NS	P1101	P1101 (1)
NS	P1102	P1102 (1)
NS	P12	P12 (1)
NS	P1201	P1201 (1)
NS	P1202	P1202 (1)
NS	P13	P13 (1)
NS	P01	P01 (1)
NS	P02	P02 (1)

File Whole\_M-Spec Annotate Print RET CREF

TITLE: P1102

PARAMETERS:

LOC1: data\_in

LOC2: data\_out

LOC3: data\_out

LOCALS:

GLOBALS:

BODY:

cells:

called by

MAINTOT\_B